REMARKS

In the Office Action mailed December 2, 2003, the Examiner requested that the entire response mailed on September 25, 2003, be resubmitted.

In the Office Action mailed March 26, 2003:

- Claims 1, 10, 11 and 20 were rejected under 35 U.S.C. 102(b) as being anticipated by Robb et al. (U.S. Patent 5,568,384).
- Claims 2-9 and 12-19 were objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Amendment

With this amendment, Applicant has completed several cross-references to related applications, corrected some typographical errors, revised the text in the paragraphs beginning at page 2, line 10 and page 6, line 24, and amended claims 1, 10, 11 and 20. No new matter has been added. Reconsideration of these rejections is respectfully requested.

Claim Rejections - 35 U.S.C. § 102(b)

Claim 1 recites a method for registering images. The first step of the method is to receive a first image and a second image, both of them including datasets of at least two dimensions; the second step is to **globally** transform one of the two images via a rigid transformation technique; the third step is to **locally** transform one of the two images via an iterative motion tracking technique; and the last step is to output a registered image. As emphasized at page 15, line 33 of the specification, applicant uses local transformation to achieve a degree of accuracy that cannot be achieved by a global transformation alone.

While Robb et al. discloses a global transformation process, it does not disclose the local transformation process recited in claim 1. This global transformation process is referred to as Chamfer matching in Robb et al. The first step of Chamfer matching is to measure the distance between each voxel in a base image and its nearest surface voxel, thereby forming a gray-level image or distance image. This is what is described by Robb et al. beginning at column 4, line 16. Later on, a cost function is derived from the root mean square (RMS) average of the distance values on the distance image that are associated with a plurality of

surface points on a match image. This is described at col. 4, lines 59-67. The best registration between the two images is presumed to be achieved when the cost function reaches its global minimum. See column 5, lines 5-7.

To expedite the process of reaching the global minimum, Chamfer matching in Robb et al. is conducted on the same base image having different resolution levels, starting from low resolution to high resolution with one level's output being the next level's input. A basic assumption in Robb et al. is that there is only one **global minimum** point in the cost function (column 5, lines 8-9) and the optimization at different resolution levels leads to the **global minimum** used for the registration transformation (column 6, lines 60-63).

Contrary to the Examiner's assertion, column 4, lines 16-23 of Robb et al. are directed to a method of distance transformation, which is actually the first step of Chamfer matching as discussed above, and not to a local transformation between the match image and the base image. And while column 6, lines 44-49 teaches that Chamfer matching is conducted at different resolution levels, Chamfer matching is still a **global** optimization process at each level that seeks to find the same cost function's global minimum.

Since Robb et al. does not teach or suggest a local transformation process, claim 1 and its dependent claim 10 are not anticipated by Robb et al.

Further, claim 10 recites that the local transformation is performed by selecting a set of feature points in one of the two images. For each feature point, the method calculates a set of local transformation parameters using a feature tracking process. The local transformation parameters used by one feature point could be different from those used by another feature point. One single local transformation only affects the proximity of one corresponding feature point. For those non-feature points, the method performs a transformation weighting process on each of them based on transformation information at surrounding feature points. *See* Figure 8.

In contrast, the two types of image points disclosed in Robb et al., real match points and outliers, are different from feature and non-feature points recited in claim 10, because both real match points and outliers are simultaneously involved in Chamfer matching. The only difference is that the outliers' contribution is restricted in the cost function.

Claims 11 and 20 recite computer program products that have substantially the same limitations as claims 1 and 10, respectively. Therefore, they are patentable for the same reasons that claims 1 and 10 are patentable as discussed above.

Claims 2-9 and 12-19 are dependent claims from claims 1 and 11, respectively. These claims have been indicated to be patentable.

In light of the above amendments and remarks, Applicant respectfully requests that the Examiner reconsider this application with a view towards allowance. The Examiner is invited to call the undersigned attorney at (650) 849-7777 if a telephone call could help resolve any remaining items.

Respectfully submitted,

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